# Large Solar Thermal Systems


f.radovic@solid.at
www.solid.at
**Franz Radovic (CEO)** Graz (Austria)

# SOLID Group - What we do

## Large scale solar plants:

- district heating nets
- hospitals, dorms,,…
- Resorts and hotels
- Swimming pools & sporting facilities
- Industrial process heat
- Solar cooling

## Existing References:

- > 250 large plants
- > 15 commercial solar cooling systems

## SOLID's scope of supply:

- Project Development
- Engineering
- Construction
- Supervision
- Operating & Maintenance

## R&D activities for Solar Thermal

## Financing:

- Third Party Financing models
- Guarantee contracts
- ESCo arrangements

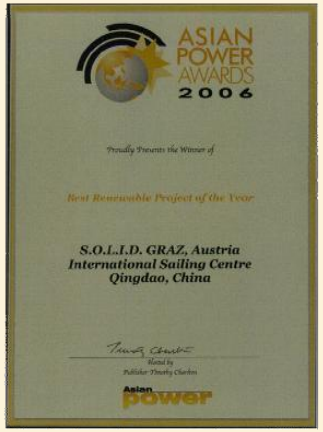
Orust Sweden, 768 m² , 540 kW , 1997

# Awards

SOLID
solarinstallation+design





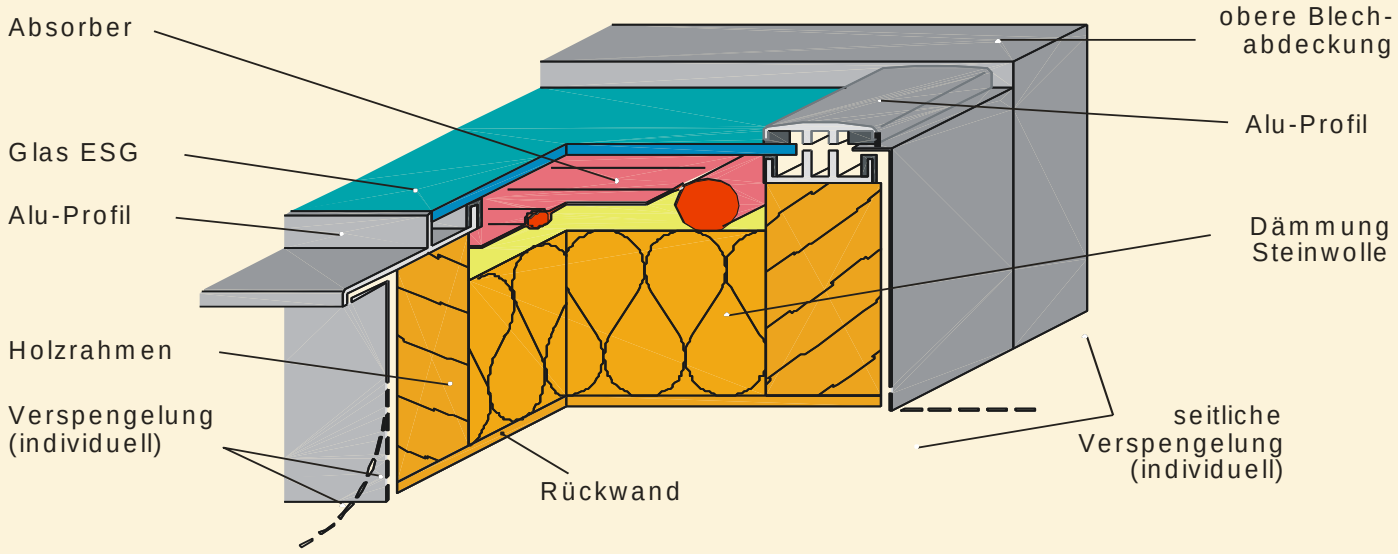




# The Collector

# Collector System

## ökoTech **Collector Construction**

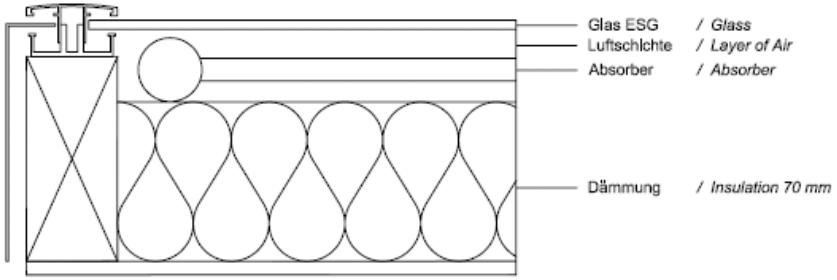
- **Aluminium Profiles**
- **Solar Security Glass 4mm**
- **Absorber (Sunstrip or Full Plate Copper)**
- **Rock Wool Insulation 70mm**
- **Rear Enclosure (OSB or Aluminium)**



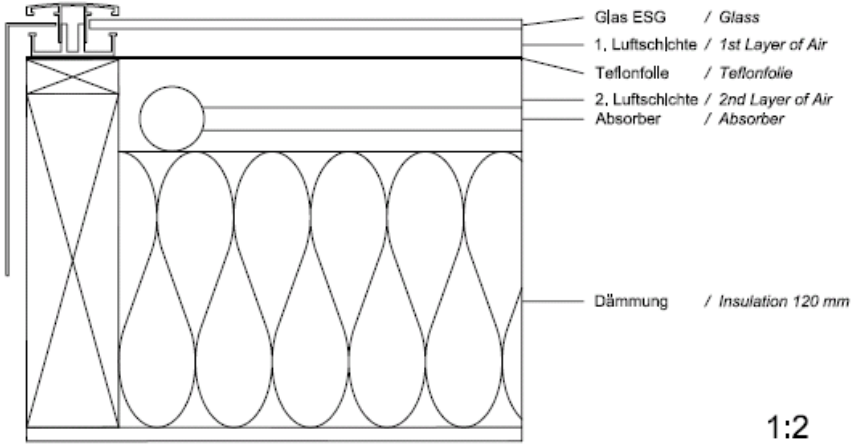
# Solar Panels

*Comparision of gluatmugl Solar Collectors*

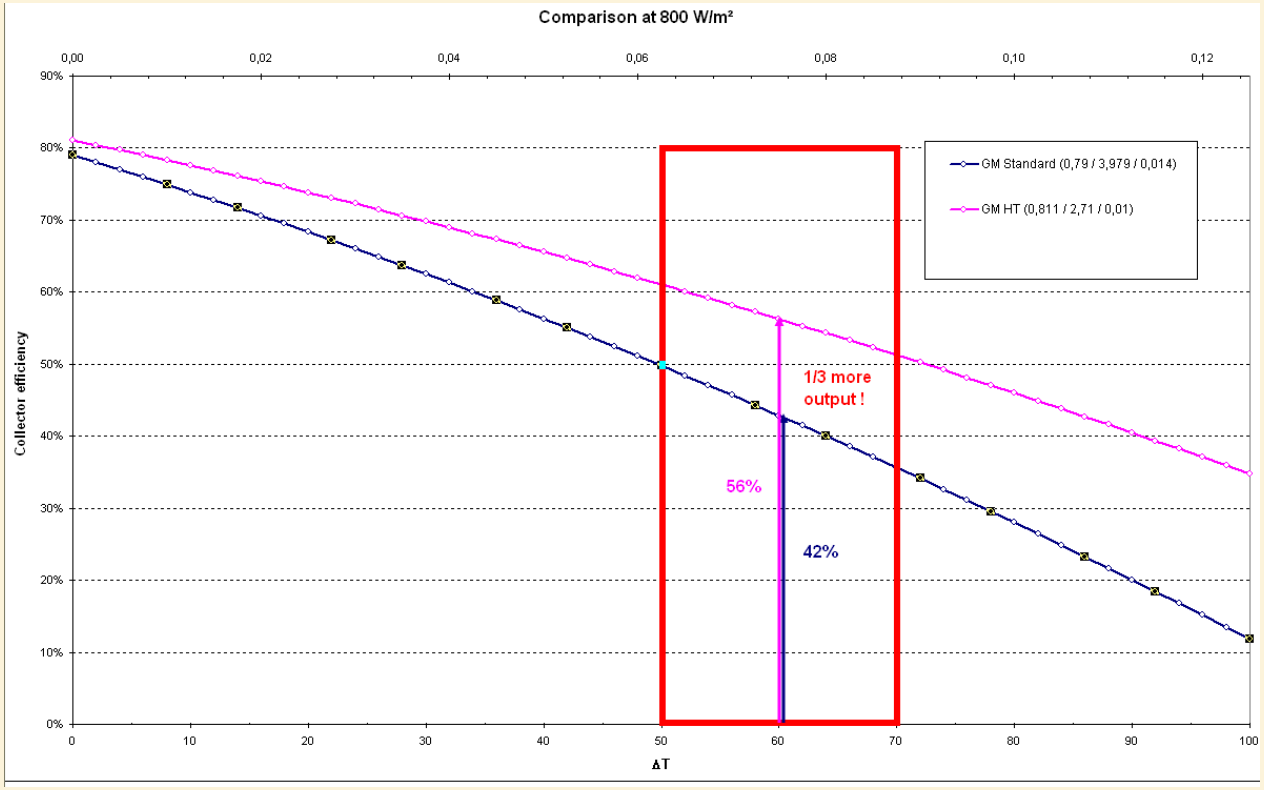
gluatmugl Standard-Kollektor
*gluatmugl Standard-Collector*




gluatmugl HT-Kollektor
*gluatmugl HT-Collector*



# Comparison Solar Panels




| | |
|---|---|
| Eta 0 | 81,1 % |
| a1 | 2.710 W/K*m² |
| a2 | 0.010 W/K²*m² |

(Arsenal test: 2.04.00667, June 2009)

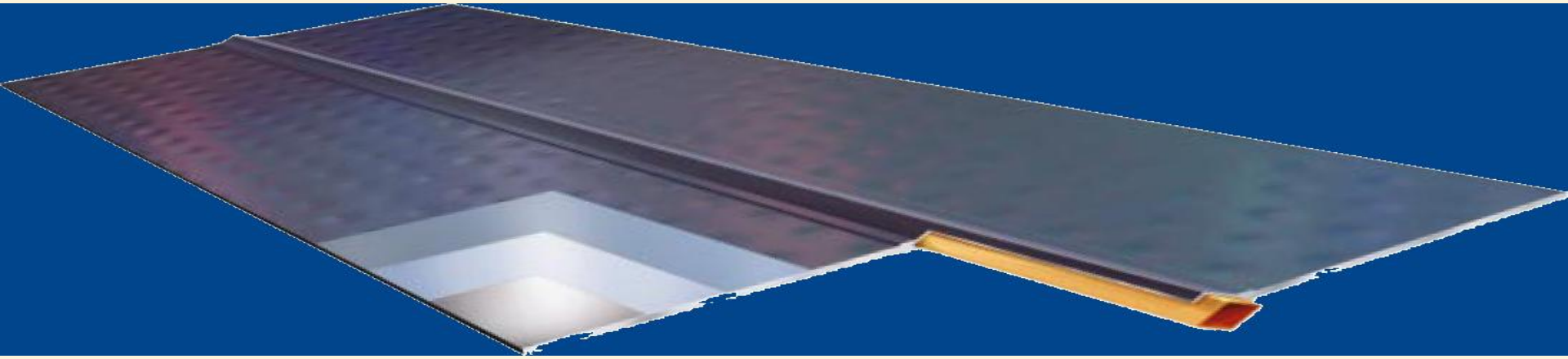
## Advantages:

- Better space usage
- Price / output ratio

SOLID
solarinstallation+design

# Sunstrip Absorber Strips

+ highly selective coating
+ fin encloses tube -
  better heat transmission
+ rhombic shape of tube -
  turbulent flow
+ coating - long term durability



# Collector System

## Absorber Types

**Sunstrip** Absorber

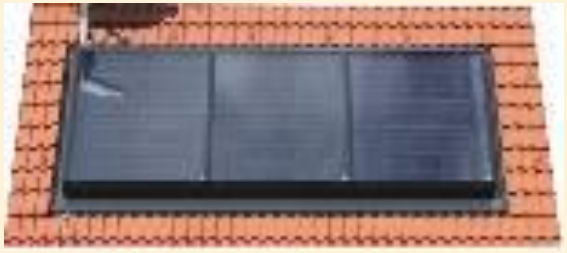
Selective Coating

Best advantages for big solarplants

**Full Plate Copper Absorber**

For small plants/DHW

## Integration



**Roof Integration**

**Ground mounting**

# Collector Size

## Modular System

**Various measurements in our modular program:** **4,2 m² → 21,7 m²**

**Each size = one peace**

| | 3x2 | 3x3 | 3x4 | 3x5 | 3x6 | 3x7 | 3x8 |
|---|---|---|---|---|---|---|---|
| 302 cm | | | | | | | |
| 233 cm | 4.8 | 7.2 | 9.6 | 12.0 | 14.3 | 16.7 | 19.1 |
| 205 cm | 4.2 | 6.3 | 8.4 | 10.5 | 12.6 | 14.7 | 16.8 |
| 105 cm | 1x2 | 1x3 | 1x4 | 1x5 | 1x6 | 1x7 | 1x8 |
| | 208 cm | 310 cm | 411 cm | 513 cm | 615 cm | 717 cm | 819 cm |

Bauartzulassung Österreich Deutschland arsenal research Ein Unternehmen des Austrian Research Centers. Kollektortest

# Special solutions



# Water-storage ? $m^3$

SOLID
solarinstallation+design

# Heatexchanger


# Absorptionchiller

# Remote Control

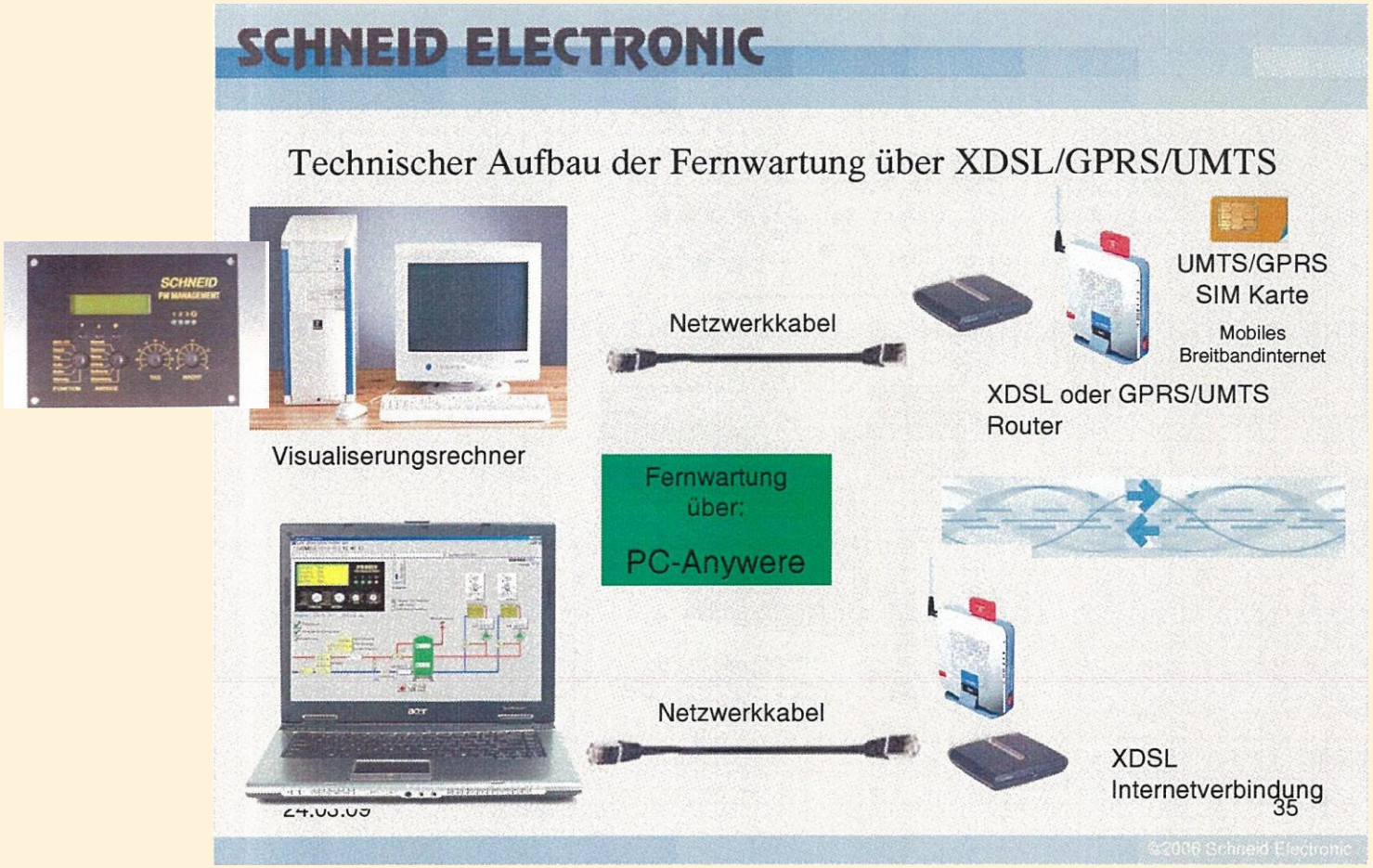
# Control-Center with PC and Screen (outside)

SOLID
solarinstallation+design

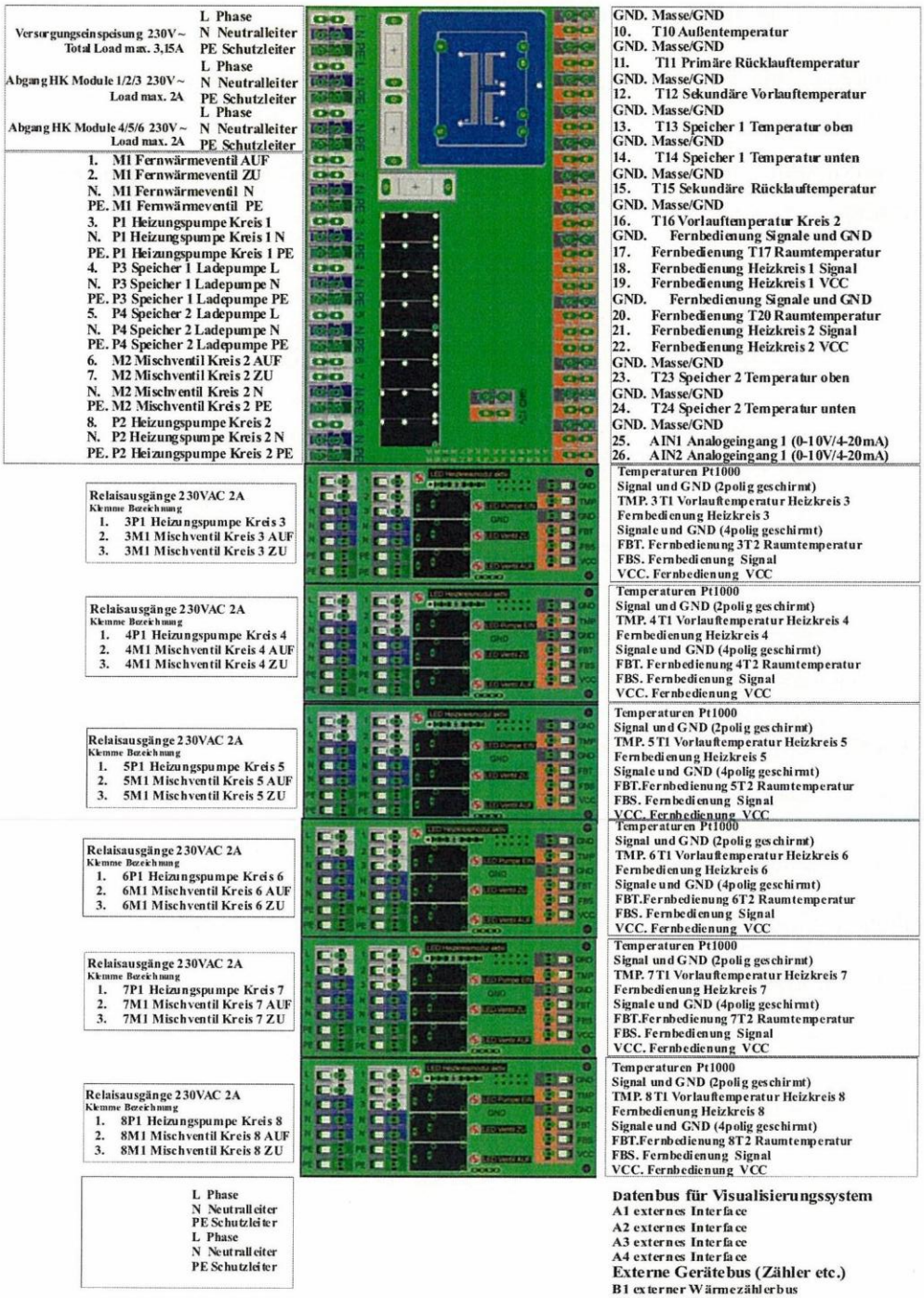
# Large Solar Thermal Systems

**TODAY Standard for Administration/Service**

PLC---------PC+Router-------Internet---------Router-PC
(Software: PcAnywhere, Teamviewer)



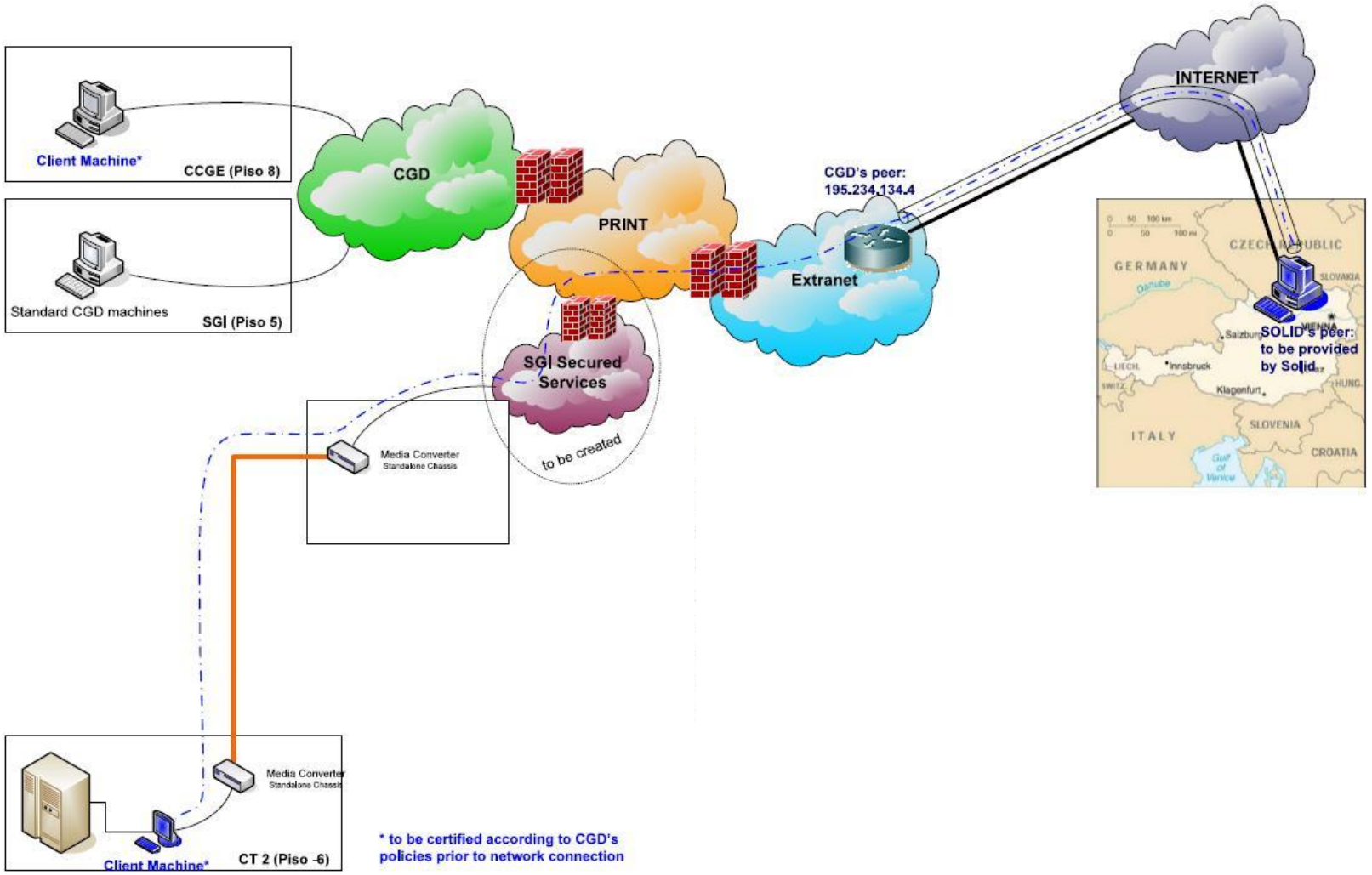
Anklemmschema:




Connection-Schematic

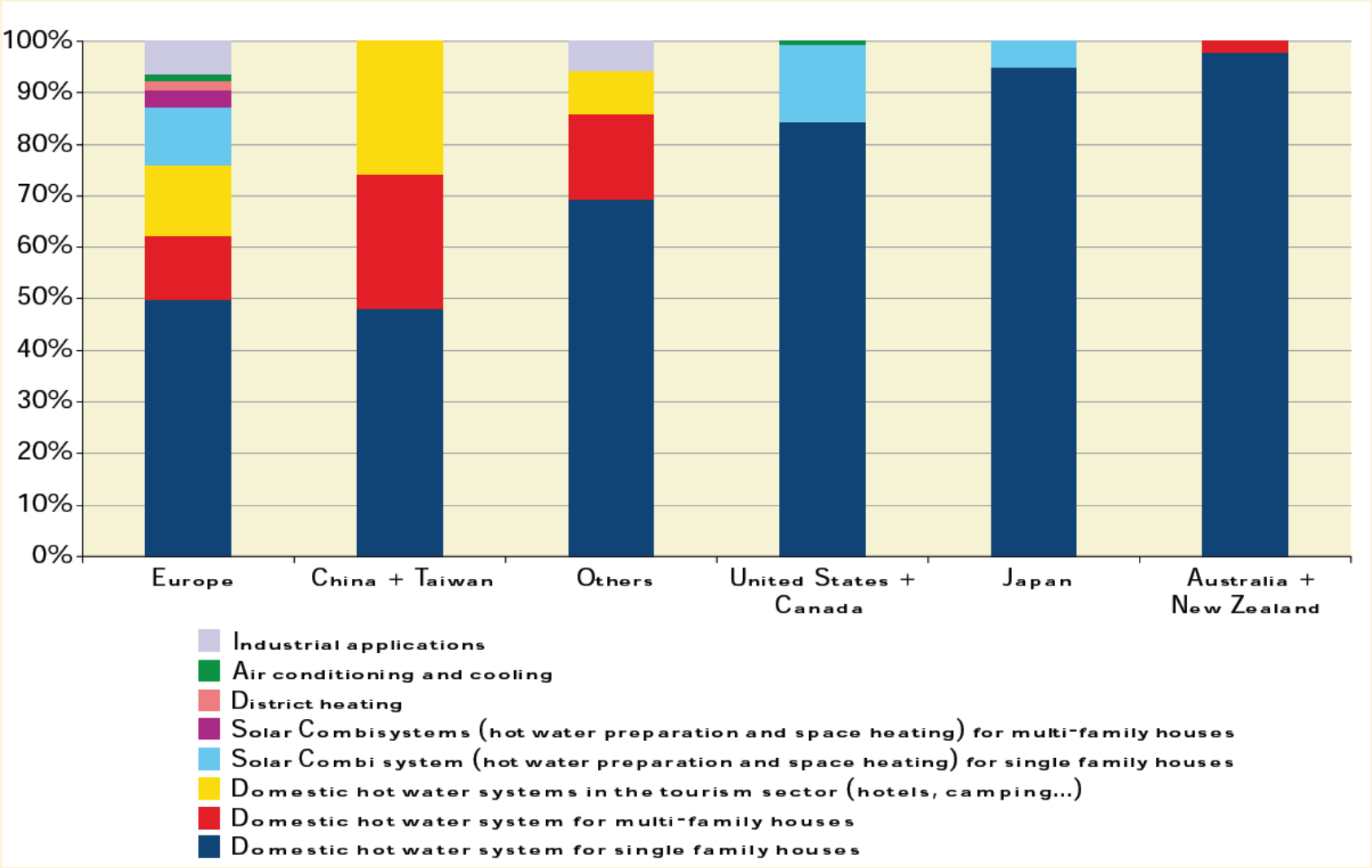
SOLID solarinstallation+design

# Large Solar Thermal Systems



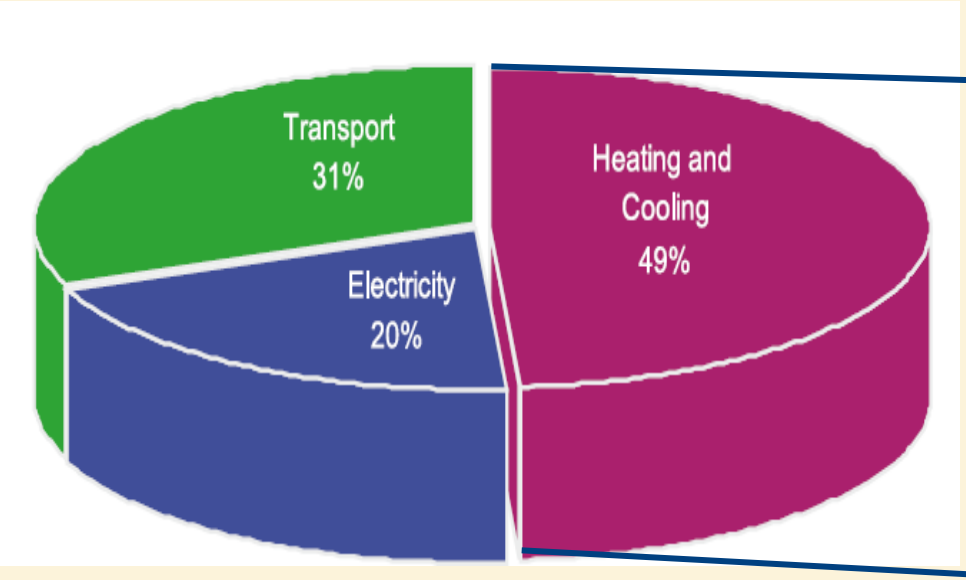
# SOLAR THERMAL WORLDWIDE

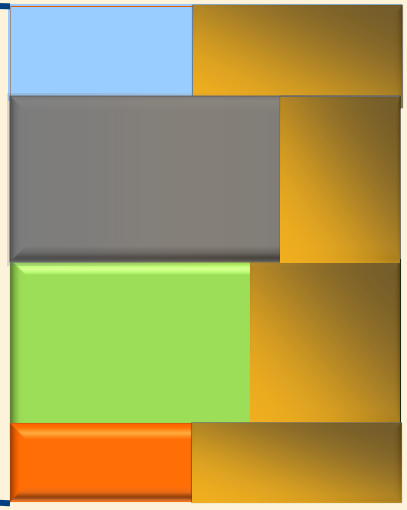
# Use of Solar Thermal Energy




Source: Solar Heating World Wide 2009, Weiß et al.

# Energy Consumption



9% COOLING

17 %
INDUSTRY

16 %
SPACE HEATING

7 % HOT WATER

50% Cooling-, 25% Industrial Heat
30% Heating and 50% Hot water
demand can be covered by
existing Solar Thermal
Technologies !

# SOLAR COOLING

# Solar Cooling- The advantage

## The peak of solar radiation and the peak demand of cooling match perfectly

We can use the same radiation that creates the demand to cover the cooling demand,

cut off electricity peaks and

avoid extreme operations on the distribution grid.

**Solar Air conditioning saves the most expensive electricity !**

# International projects - Exampels

Phoenix , AZ, Lanta Self Storage,

Solar Panels: 500 m²  Cooling Power:  105 kW

# International projects - Exampels

100,000 m² Offices

5,000 people working in the building

11 floors above ground, 6 floors under ground

Bank building including employees hospital, theater, restaurants

Lisbon, PT, Caixa Geral de Depositos

Solar Panels: 1579 m²  Cooling Power:  545 kW

# International projects - Exampels

Qingdao, China, Olympic Sailing Village

Solar Panels: 1279 m²  Cooling Power:  512 kW

# Gatorade Pepsico

Gatorade (Pepsi Cola)
Phoenix , AZ, (2008)

Solar Hot Water for process heat in the soft drink industry.

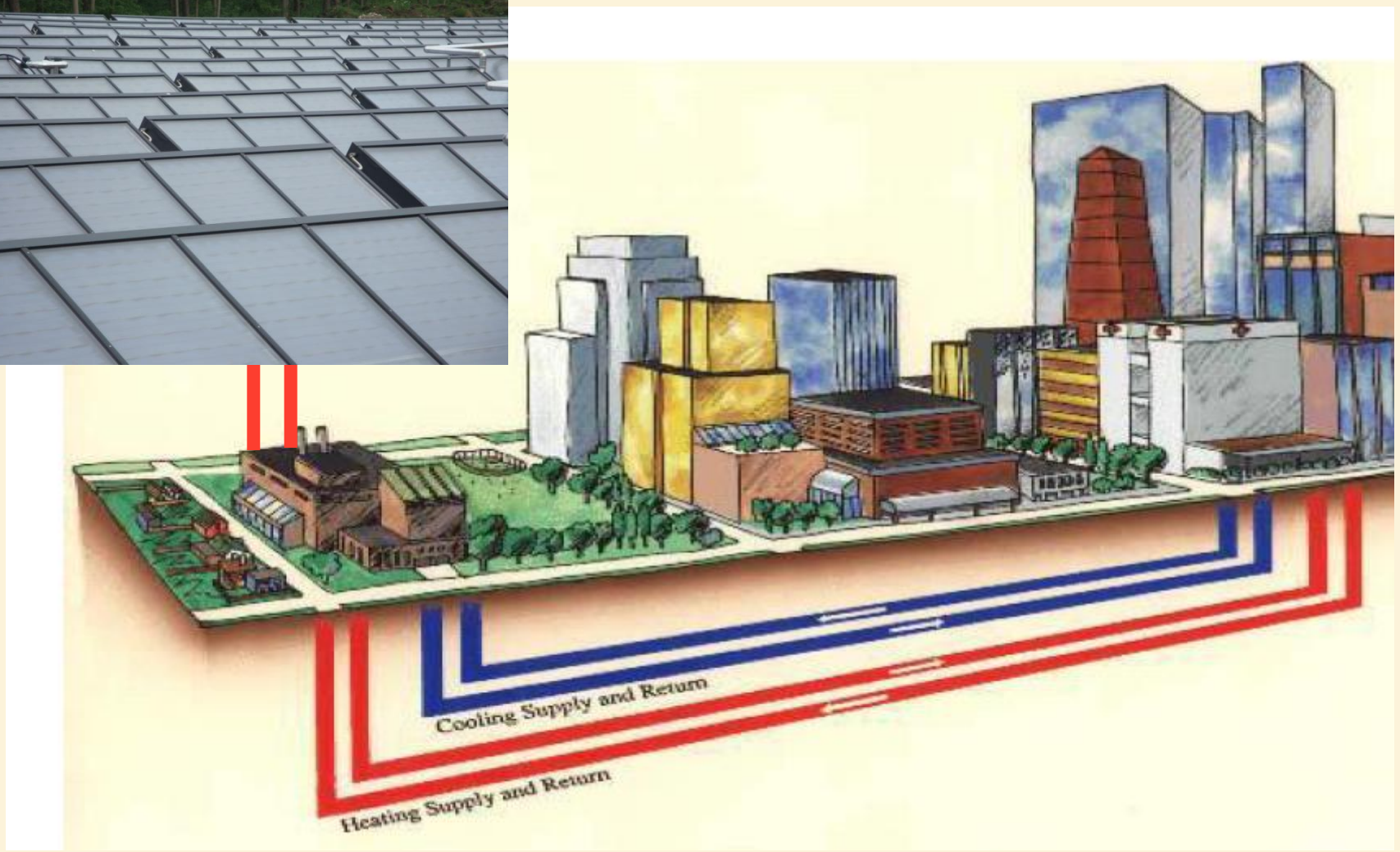
Biggest process heat installation on the American continent.

Solar Panels:
893 m² / 9,600 ft²

625 kW

# District Heating & Cooling

SOLID
solarinstallation+design



# Latest Projects

Harvard University, Boston

DHW only

Hyatt´-Regency United World College (UWC), Singapore

Contract signed

500 ton cooling +DHW

Parliament of Lisbon/Portugal

# Large scale Solar Thermal

SOLID
solarinstallation+design